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NOTES ON THE CALENDAR AND THE ALMANAC

BY

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NOTES ON THE CALENDAR AND THE ALMANAC.

BY GEORGE EMERY LITTLEFIELD.

In answering the question, why do the officers of public libraries and bibliophiles so highly esteem and strive to make collections of old calendars and almanacs, it may be said that the calendar was coeval with and had a great influence upon civilization. Indeed, the slow but gradual formation of what we know as a calendar is an excellent illustration of the progress of civilization. At first it was a very crude scheme for recording the passing of time, deduced from irregular observations of the rising and setting of a few fixed stars, by a people who had but recently emerged from barbarism. The resultant table was of very little value and required constant revision and correction. It was only by long and patient study and observation, by gaining knowledge from repeated failures, that finally was produced the accurate and scientific register, which today bears the name of calendar.

Furthermore, the material and shape of the tablet upon which the calendar was engraved or printed, was a constant temptation to artists to decorate it with pencil or brush, which caused it to become a valuable medium for inculcating in the minds of the people, ideas of the sublime and beautiful, and never more so than at the present time.

As regards the almanac, it also is of ancient memory, as we have positive evidence of its existence more than twelve hundred years before the Christian era. To its compilation scientists, philosophers, theologians, poets

and artists, have eagerly contributed and it has disseminated valuable information among millions of people, who without it would have remained in ignorance. Even at the present day a bunch of almanacs may be found in many a farmer's kitchen, suspended from a peg or nail in the wall near the fireplace. At the beginning of a year the new almanac is sure to be secured and is religiously preserved by being sewn to its predecessors, and not infrequently this bunch of almanacs constitutes the family library.

It is to emphasize these and other reasons for the preservation of calendars and almanacs, and to give a compendious history of them that these notes have been prepared.

Of calendars, or orderly lists of persons, things, and events, there are many kinds: for instance, a calendar of state papers; a calendar of bills presented in a legislative assembly; a calendar of causes arranged for trial in court. The Calendar which we are to consider is defined by Webster as "an orderly arrangement of the divisions of time, adapted to the purposes of civil life, as years, months, weeks, and days; a register of the year with its divisions." It refers to time in general and to the tables which have been invented to register its progress. It may refer to a single year, or it may refer to the general scheme adopted by astronomers by which time may be measured without reference to any particular year. It is a general table of the days and months of a period of time called a year from which may be deduced the days and months of any particular year. It is a scheme for the division of time, and changes in this scheme can be made only by those appointed by the government for that purpose. Thus we have the Egyptian, Chinese, Jewish, Roman, Gregorian and Aztec calendars, the names of which sufficiently indicate their character and denote that they are national modes of registering the course of time by the season's progress.

On the contrary the almanac practically is limited to one year or that portion of time which is comprehended

in the annual revolution of the earth around the sun, and relates to the affairs of men. It is defined by Webster as "a book or table containing a calendar of days, weeks, and months, to which astronomical data and various statistics are often added, such as the times of the rising and setting of the sun and moon, changes of the moon, eclipses, hours of full tide, stated festivals of Churches, terms of court, etc." Anyone who so desires can frame an almanac by simply adding to the calendar of the year such other tables as he chooses and whatever information he wishes to promulgate. This privilege has been exercised from very early times to the present day, although on account of abuses it has been found necessary in some countries to regulate it by public statutes. Although in making up his almanac the compiler has a very free hand yet he never attempts to change the calendar.

It is evident therefore that there is a distinction between the terms calendar and almanac, and many so-called calendars and almanacs are wrongly named. The line of demarcation however is not clearly defined, nor can any hard and fast rule be laid down by which one can be distinguished from the other. Mr. John Brady in his "Clavis Calendaria" says, "We may with propriety use calendar or almanac for any particular year, but, as allusive to time in general, calendar can alone be properly applied. The calendar denotes the settled and national mode of registering the course of time by the sun's progress; an almanac is a subsidiary manual formed out of that instrument."

Much has been written and many theories advanced as to the origin and the earliest usage of the terms calendar and almanac. The origin of the term calendar seems to be pretty firmly established, but almanac still poses in the dictionaries as of "origin unknown." As the objects which they represent were in use centuries before these terms were attached to them, no great harm can follow, if, until proof to the contrary is offered, we allow the conclusions of those who claim that

the term calendar is of Roman origin, and that the designation almanac is derived from the Arabic article *al*, the; and the Hebrew verb, *manach*,to count.

The calendar is in no manner dependent upon the almanac. It can stand alone and in many cases is more to be desired when alone than when accompanied by statistical or other tables. The calendar for the single year is familiar to us in the large cards or posters which we receive annually from banking and insurance offices and commercial houses, as reminders that our patronage would be welcomed. They contain simply the days and months of the year and are handsomely and artistically decorated in order that we may be induced to hang them on the walls of our offices and houses as ornaments and thus advertise the giver for at least one year. A writer in the *Boston Herald*, December 8, 1913, says: "The time of the year is near at hand when you will expect to drop into your dealer's and receive, free of charge, a calendar to replace the old 1913 one now hanging upon your room wall or over your desk. As a matter of fact you will probably receive between now and the first of January several of these indispensables and the fact that a small advertisement is imprinted upon each of them in no way prejudices you against them. For calendars and advertisements are considered as inseparable by most of us. Few people, however, realize the extent of the industry which this first-of-the-year calendar demand has created. The magnitude of the business is impressively suggested by the fact, that not long ago a convention of concerns manufacturing calendars and and allied advertising novelties was held, at which were represented firms whose combined capital exceeded $10,500,000, and whose annual volume of business goes well over the thirty-million-dollar mark. Yet all the calendar manufacturers are not included in this association by any means, and the total output of day-markers is estimated at close to fifty million dollars."

Although the great feature of the almanac was and is the calendar yet the main object of including it was to

attract popular attention, for without it the almanac would vary but little from, nor be more to be desired than many other manuals of general information.

Generally speaking, almanacs were not given away, but were exposed for sale just the same as any other book. An early printed almanac, that of Regiomentanus, 1476, was quarto in size, contained twelve leaves, and sold for ten crowns in gold. It gave the calendar, the eclipses for the year and the places of the planets. An excellent example of the almanac of the present day is "The World Almanac and Encyclopaedia," published by the New York *World*, a newspaper which has a daily circulation of over 700,000 copies. This almanac contains over 600 solidly printed pages of important and interesting information on a great variety of subjects, political, religious, commercial, social, and others too numerous to mention. Many of these subjects are carefully tabulated and the almanac more than justifies its second title, for it is indeed an encyclopaedia, or a comprehensive summary of knowledge.

Primitive man, wandering over the plains of Assyria and Mesopotamia needed neither a calendar nor an almanac. The passing of the year, a long unit of time of which he had no conception, had no significance for him: months followed months in regular succession without exciting any interest in him; the day, which was the only unit of time within his comprehension, was spent in hunting and fishing; while the night was devoted to sleep. The temperature of the country in which he lived was warm and comfortable and not subject to great climatic changes. The woods and streams bountifully supplied all of his needs. His wants were few, he led a simple life; he was a barbarian.

When, however, after centuries of roving he finally selected a favorable situation, ceased from wandering, maintained a fixed habitation, and lived upon herds and flocks of domesticated animals, the conditions were changed. His mind awoke to the fact that there were many things in this world of which he had never dreamed,

and that new responsibilities had been thrust upon him. In order to preserve his own life and the lives of his flocks and herds he must provide the means of subsistence, and in order to ward off the attacks of marauding neighbors he was obliged to prepare means of defence. Barbarism disappeared; civilization began; the age of progress was commencing.

To procure the means of subsistence man was compelled to till the soil which gave rise to the science of agriculture, or the art of preparing the ground, planting the seeds, harvesting the crops, and the rearing and management of live stock. In all ages and among all nations man has paid great attention to agriculture and no science has risen to a higher degree of perfection. In his "Remarks on Agriculture" Daniel Webster says "When tillage begins, other arts follow. The farmers therefore are the founders of human civilization."

Man soon discovered that there were laws regulating the planting of seeds which if neglected caused a failure of crops. By experience he learned that the sun caused changes in the climate and these changes having consumed a certain portion of time were immediately repeated. He found that he must plant in one of these changes and harvest in another, and that seed-time and harvest were not interchangeable. His unit of time, therefore, was lengthened from a day to the time which included one complete series of these changes or seasons, which we call a year. To determine this new unit of time, or the length of the year, must have taken centuries of observations of the sun, as the seasons evidently were caused by the position of the sun in the heavens. Man, however, did not jump immediately from the day to the year. His mind was not competent to grasp so long a time-unit as a year. There must be an intermediate period. Even when wandering he needed some standard to measure the progress of time. Naturally his first unit of time would be the time between sunrise and sunset. But the varying length of this unit would make it an uncertain standard until by experience he

learned to include in this unit the period of darkness and to divide the time between one sunrise and its successor into twenty-four equal parts. Naturally his attention would be attracted by the changes in the appearances of the moon. After having passed through a series of changes it was observed that the series was immediately repeated. The time occupied in passing through one series of changes would suggest to him a larger unit of time, or what we call a month, although it is doubtful if man in his wandering condition ever used as a measurement of time any unit larger than a day. When, however, he had begun to till the soil he observed that in one complete series of seasons, or a year, there were several repetitions of the changes of the moon, or months. It was therefore through the month that he was able to comprehend the year. The moon, however, did not cause the seasons, and man learned that the length of the year could be ascertained only by observation of the sun. How man determined the true length of the solar year, or the space of time occupied by the earth in making the entire revolution of its orbit is the crux of philosophers. Many centuries must have passed, and many generations of men must have succeeded each other before this knowledge was acquired.

Layard in "Nineveh and its Remains" says, "The origin of the Chaldaean theology has ever been a favorite theme of the poet and philosopher. The Assyrian plains, uninterrupted by a single eminence, and rarely shadowed by a passing cloud, were looked upon as a fit place for the birth of a system which recognized the heavenly bodies as types of the supreme power and invested them with supernatural influences. The wonderful regularity of their periodical moments, their splendor, and even their effects upon the physical world must have been apparent to the Chaldaean shepherd long before they became the study of the philosopher and the priest. Whilst he watched his sheep by night, he marked the stars as they rose above the horizon, and learned to distinguish one from another, and to invest

the most remarkable groups with distinct forms. If the attributes of the Deity were to be typified, if the limited intellect of man required palpable symbols to convey ideas which he could not understand in the abstract, more appropriate objects could not have been chosen than those bright luminaries whose motions and influences were enveloped in mystery, although they themselves were constantly present. The transition from this adoration to a national system of astronomy is natural; and it is not surprising that the Chaldaeans, being the first to invest the heavenly bodies with sacred properties, should have been also the first to cultivate the sublimest sciences. The periodical movements of the heavenly bodies were ascertained by constant observations, originating probably in religious duties; their causes were investigated and in process of time their motions were calculated and predicted. At a very early period the Assyrian priests were able to fix the dates of events by celestial phenomena, and to connect the public records with them. When Alexander entered Babylon, 330 B. C., he is said to have been presented with the Archives of the empire, verified by astronomical calculations which extended over a period of many centuries, and Callisthenes was able to send to his relation and teacher Aristotle, the celestial observations of 1900 years." This statement, however, is too general and does not explain how early man was enabled to solve the problem which was so important to him by the movements of the heavenly bodies.

In a book published in 1905 entitled *The Rational Almanac*, Mr. Moses B. Cotsworth of York, England, claims that the problem was solved by means of the Pyramids and that "the real object of these stupendous erections was to determine the seasons and exact length of the year by their regular graded and recurring shadows. That those massive towering works whether called Vertical Stones, Sun-stones, Monoliths, Obelisks, or Pyramids, and whether in Egypt, Arabia, Mexico, France, Great Britain, or elsewhere, were to be used to

solve the Seasons, that greatest problem of early man the knowledge of which could be applied to ensure reliable crops for yearly food." He visited many of these monuments in Egypt, Arabia and Great Britain and with the aid of theodolite, transit, and camera, made many observations and investigations which proved conclusively to him that his theory was correct. Accounts of his observations, results of his investigations, and many of his calculations are recorded in his almanac, the reading of which is recommended to anyone interested in the subject.

In the summation Mr. Cotsworth says, "The Observant priests and rulers of the Egyptians, who realized that famines were largely caused by ignorant people sowing in wrong seasons, had a most difficult problem to solve because their numerous people lived in narrow strips of cultivated land, extending over 1,000 miles southward which could not be widened beyond the desert hills bounding the valley of the Nile. As this territory involved ranges of climate about equal to those between Canada and Mexico, not only did the kind of crops vary but also the times of the year at which the soils must be prepared and crops sown. Therefore it was an imperative necessity that they should have almanacs throughout Egypt to know exactly what agricultural work required doing at precise times as we do now. Some tried years of twelve lunar months (354 days) which in three years removed their almanac times over a month, causing wrong sowing times. Then the geometric year of 360 days to a yearly cycle was used by some, who consequently within six years drifted their time more than a month out of gear with seasons and got worse as time went on. . . . Yet, as population increased in that easy living country, the growing need for food called forth intense necessity for increasing the yearly food crops by repeated sowings and greater varieties which the priests and rulers knew could only be maintained by truer almanac records, and as all the people worshipped the sun, the priestly observers were able to induce the

people to co-operate with them in raising that wonderful series of pyramids which my long series of experiments has convinced me were successively built for the great purpose of finding out the length of the year, after the priests had by experience realized that their mighty object could best be obtained by studying the sun's meridian shadows cast from the highest pointed erections they could best build as pyramids. The stupendous height to which they carried their pyramids is easily explained by their enormously perplexing difficulty in settling the true length of the year, which could only be differentiated by comparing the equinoxial noon shadows, cast from the great heights to which their pyramids were so sacrificingly raised for this most adequate of objects men ever had in view, the permanent assurance of their individual and national life.

"After the year's length was found out by the study of the Great Pyramids' shadows, the Egyptian rulers by counting days and forming a calendar could so arrange their agricultural sowings with such accuracy that full and regular crops could be relied upon, not only to supply all internal requirements, but also to enable their country to become the granary for surrounding nations, whose wealth could be thus attracted to Egypt when, as we know from the earliest records, neighboring nations could know that 'there was corn in Egypt'—a phrase which has lived through about forty centuries and still indicates the place of plenty.

"The designers, erectors, or keepers of these pyramids in Egypt, Mexico, and elsewhere, are known to have constructed, amended and reformed the calendar from time to time, for which great benefits they have been revered by subsequent generations . . . . The Great Pyramid of Egypt, the last built and the most perfect, is so constructed that it 'consumes its own shadow' at mid-day of the Vernal Equinox, or March 25th, when the oldest complete style of year began.

"Surely we cannot but admit that such a glorious result as the birth of the calendar for the welfare of the Egyp-

tian people and the furtherance of civilization was well worth all the vast efforts and stupendous labors expended in building even the vast series of Egyptian pyramids to bring forth the knowledge of the true year, which is the greatest permanent and most practically valuable factor ever made known to humanity."

Having by observations of the sun and the pyramidal shadows ascertained the true length of the year it was possible to calculate the movements of the other heavenly bodies, especially by observations in the night of the various planets and stars, and the crude astronomy of the preceding ages became a science. This method of studying the heavens was so superior to the pyramidal method that it was adopted altogether. The pyramid became obsolete and the object for which they had been built was forgotten, and they became tombs for kings.

Mr. Cotsworth's theory seems to be a reasonable solution of the question how the length of the solar year was ascertained. Allowing that his theory is correct, as the Great Pyramid is supposed to have been built 3,000 years before the Christian era, our calendar is nearly 5,000 years old.

Mr. Cotsworth says, "The development of Egyptian Zodiacs and Almanacs was mostly rigidly kept secret through many generations but ultimately they were sculptured on the tombs of the kings, showing the supreme importance that the Egyptians attached to improving their almanacs during thousands of years."

He concludes as follows, "All the foregoing considerations impress us with the fact that the highest powers and greatest efforts of early men were employed towards developing our almanac or calendar for practical use in life and that since then the leaders of men have ever prized and built upon that foundation stone of true knowledge."

The discovery of the true length of the year by observations of the shadows cast by the pyramids became the basis for deducing the laws which govern the movements

of the stars and laid the foundation of astronomy as we now understand it.

Astronomy has been called the first and most sublime of all the sciences and the Chaldaeans and the Egyptians appear to have been among the earliest nations to cultivate this science. By it they were able to materially improve their condition and to make their nations superior to the other nations of antiquity. In early days the Egyptians appear to have taken the lead in philosophical pursuits, and it was to Egypt that the Greeks were indebted for their lessons in science. The Greeks, however, showed their genius by developing the knowledge they had acquired from the Egyptians and carrying it to a higher degree of perfection. Among their great astronomers were Thales (640 B. C.), Pythagoras (500 B. C.), Meton (432 B. C.), Eudoxus (370 B. C.), Hipparchus (160-125 B. C.), and Ptolemy (130-160 A. D.), the founder of the Ptolemaic system, so-called because Ptolemy is the sole existing authority on the subject of ancient astronomy. This system, which is set forth in his work on astronomy known as the "Almagest," places the earth immovable in the centre of the universe and makes the entire heavens revolve around it in the course of twenty-four hours. It was universally accepted as the true theory of the universe and the "Almagest" was the standard text-book on astronomy until the time of Copernicus. In 1542 Nicolas Copernicus, a German astronomer, published "De Revolutionibus Orbium" in which he advanced the theory that the sun is the immovable centre of the universe, around which all the planets revolve in concentric orbits, Mercury and Venus within the earth's orbit and all the other planets without. This system, now known as the Copernican system, is considered to be unquestionably the true system of the universe. Although Copernicus based his system upon the "Kosmos" of Pythagoras yet he has the credit, after the lapse of centuries, of drawing the attention of philosophers to it and of having increased the probability of its truth by his calculations and arguments.

Notwithstanding the great advance in the science of astronomy, especially during the last century, the Ancient Egyptians had attained a high degree of proficiency in it. Previous to 1500 B. C. they knew that the length of the solar year was 365¼ days. Although they divided the year into twelve lunar months, yet they knew how to intercalate the necessary number of days in order to prevent a disturbance of the seasons, and also to provide for the odd fraction by introducing an extra day at the proper time. They divided their year into three seasons of four months each, viz., spring, or flowering season, summer or harvest season, and the inundation. They used weeks of seven days, and days and nights of twelve hours each, from very early times. Each month had its name and was supposed to be under the influence of a god, and each day was dedicated to a patron saint. They knew the theory of the obliquity of the ecliptic, of the Zodiac, that broad belt in the heavens containing the twelve signs through which the sun passes in his annual course, of the borrowed light of the moon, of the revolution of the earth on its axis, of eclipses, and comets. They used the clepsydra as a clock, the gnomon for determining the solstices, and a hemispherical dial for ascertaining the position of the sun.

The reputation of the Egyptians spread abroad and attracted the attention of the philosophers of other nations who visited Egypt for the express purpose of being taught by the Egyptian priests. Thales and Pythagoras both acknowledged their indebtedness to the Egyptian priests for instruction in several of the sciences. The Greeks taught the Romans, who in turn carried the knowledge all over Western Europe, and from them it has descended to us.

As agriculture was the basis of civilization the necessity of a method of computing time to aid in keeping pace with the passing of the seasons, to know when to plant in order to be sure of a harvest, in other words the need of a calendar was imperative not only to the Egyptians,

but also to all other civilized nations. Basing their investigations upon the lunar and solar systems all have arrived at the same result, namely, a method of computing time by means of the day, the month, and the year. Wherever we go, whether to Egypt, Assyria, Greece, Italy, Mexico, we find time computed by the same general system.

There was, however, a difference as to the time when the year began, as to the number of months in a year, and as to the length of the days. Thus, although the general plan was practically the same, the different arrangement of its many parts gave rise to varied computations and great complications.

In order to preserve a proper recurrence of the seasons use was made of various cycles, which had been invented by astronomers and mathematicians, such as the Egyptian Sothiac Cycle of 1460 years; the Persian Cycle of 120 years; the Chinese Cycle of 60 years; the Aztec Cycle of 52 years; and the Grecian Metonic Cycle of 19 years. It is on account of these and other cycles that we have so many calendars, and curiously enough we find by a study of the Mexican Calendar Stone that the Aztec Calendar was as perfect as any other.

The seasons are dependent on the progressive and periodical changes of the sun's place in declination. The declination is maximum at the Tropics and zero at the Equinoxes. Hence the tropical or equinoctial year is the interval between two successive arrivals of the sun at the same tropic or same point on the equator. The mean length is 365 d. 5 h. 48 m. 46 s.

As shown, this length was approximately ascertained by the ancient Egyptians by measuring from day to day at noon the shadow of a vertical gnomon or pyramid erected for the purpose on a horizontal plane. The shadow is necessarily minimum on the day of the summer solstice, and the interval between two such minima is the number of entire days in the solar year. A calendar year of 365 days would, however, go backward in reference to the tropical year about twenty-five days in a

century, and the fact, if not the amount, would soon become perceptible and therefore six hours and a fraction must be added to the length of the calendar year, or one day in four years, to prevent the displacement.

Although the Greeks are supposed to have learned their Astronomy from the Egyptians, the Egyptian priests evidently retained the secret of the solar year, for from the time of Solon, who was born about 638 B. C. and was an archon in 594 B. C., the Greek year consisted of twelve lunar months, or 354 days, the seasons being adjusted by adding three months in the course of eight years. It was not until the time of Eudoxus who flourished about 366 B. C., and who spent thirteen years of his life in study with the Egyptian priests, that the solar year was adopted by the Greeks.

In their calculations the Greeks considered the movements both of the sun and the moon, but the phases of the moon were more easily observed and the Greek calendar was based upon them. In attempting to combine the courses of the sun and moon the Greeks found themselves involved in great difficulties. In early times it was believed that the course of the moon, or a lunation, was exactly thirty days and that twelve of these lunations took place in one revolution of the sun. It was found out, however, that the first new moon of the second year arose six days too early and the solar year had five days more before completion.

They then removed six days from the lunar year by making the months thirty and twenty-nine days alternately, and as the lunar year was now eleven days shorter than the solar year they intercalated twenty-two days at the end of every other year. At the end of four years they found that the lunar year was shorter than the solar year by one day, owing to the excess of six hours over 365 days in a solar year, and this excess had not been provided for in the intercalatory period. In order to remedy this shortage a new method of reckoning was introduced by which the intercalation was made at the end of four years instead of two, and consisted of

forty-five days, the first three years of this four-year cycle containing 354 days and the fourth year 399 days.

Iphitus, King of Elis, is said to have selected this intercalatory period of forty-five days, about 884 B. C., as the proper time during which to hold the Olympic games, from which time they were regularly held. The interval of four years between each celebration was called an Olympiad, and it is from this that arose the method of computing time by Olympiads, or cycles of four years, although it was not until the victory of Coroebus in the foot-race 776 B. C. that they were employed as a chronological era.

In the course of time it was found that this four-year cycle was not correct and other experiments were tried in order to find some method by which errors might be removed, but without success until Meton, an Athenian astronomer, discovered that in the space of 19 solar years there were 235 revolutions of the moon, and that all the difference there was between one and the other was not more than one hour and a half at the end of 19 years, after which the moon found itself to have preceded only by that little time of one hour and a half the place where it found itself before with the sun.

Meton proposed cycles of 19 years, or 6940 days, distributed into months, so that they corresponded to the changes of the moon throughout the whole period. This method of computation, first adopted by the Athenians in 432 B. C., was so enthusiastically received that it was ordered to be written with large golden letters on a tablet and set up in the market-place at Athens. It was called the year of Meton and the calendar based upon it was published at Athens in the fourth year of the 86th Olympiad and began with the 16th of July, 432 B. C. It is also known as the Lunar Cycle and that number, from 1 to 19 inclusive, showing what year of this cycle any given year may be is called the Golden Number to this day.

The months of thirty days were known as the full months and those of twenty-nine days as the hollow

months. The first of the month, known as νουμηνία, new moon, was not the day of the conjunction but the day on the evening of which the new moon first appeared. The full moon occurred on the middle of the month and that day, the fifteenth, was called διχόμηνις or the divider of the month.

The Attic year began with the summer solstice and each month was divided into three decades. The first decade, from the first day to the tenth inclusive, was μὴν ἱστάμενος, beginning of the month, and, with the exception of the first day, the days were regularly counted as the second, third, etc., up to and including the tenth (δέκα), commencement days. The second decade, from the tenth to and including the twentieth, was μὴν μεσῶν, middle of the month and the days were counted regularly πρώτη, δεύτερα, ἐπὶ δέκα first, second, etc., after the tenth, or μεσόντος, middle days, the twentieth being called, εἰκάς. The third decade, from the twentieth to the thirtieth was μὴν φθίνων waning of the month, and they were counted regularly either onwards as πρώτη, δεύτερα, ἐπι εἰκάδι first, second, etc., after the twentieth, or backwards as δεκάτη, φθίνοντος, etc., tenth, ninth, etc., waning days.

Central and Southern Italy were settled by colonies from Greece long before the foundation of Rome, and naturally the manners and customs of the home country were continued in the new. Romulus, who was of Alban descent, and who, according to tradition, founded Rome about 753 B. C. is said to have formed the original Roman calendar. This Roman year, like the year of the Albans, is said to have consisted of ten months, four of the months having 31 days and six 30. The four longer months, Martius, Maius, Quintilis, and October were called full months. The six shorter months, Aprilis, Junius, Sextilis, September, November, and December, were called hollow months. Martius was the first month, the year beginning with the vernal equinox. The year is supposed to have been the lunar year and the months to have coincided with the lunar period, but the 304

days in this year fall greatly short of the solar year, and how that difference was made up no real explanation is given, but apparently left to conjecture. Macrobius says the proper number of days required to complete the year were added, but these days did not receive any name as a month. Servius speaks of the intercalated period as consisting of two months which at first had no name but were eventually called Janus and Februus. Little more seems to have been handed down with regard to the earliest year of the Romans.

Numa Pompilius, the immediate successor of Romulus, is credited with instituting a year of twelve months, or 355 days, although the moon in twelve lunations appeared to complete but 354 days, the excess of one day being variously accounted for. To the Romulian year he added fifty-one days, but as these days were not sufficient to constitute two months he took a day from each of the hollow months which, added to the 51, made 57 days, out of which two months were formed, January with 29 and February with 28 days. The year, still beginning with March, consisted of twelve lunar months, four of which contained 31 days, seven 29, and one 28 days. All contained an odd number of days save February which alone was hollow, and hence deemed more unlucky than the rest.

At the end of two years, the year of Numa would have been about 22 days in arrear of the solar period and accordingly Numa is credited with inserting an intercalary month of 22 or 23 days in alternate years, at or near the end of February, to bring the civil year into agreement with the return of the seasons and to which was given the name of Mercidonius.

Although credited to Numa it is not really known when the year of 355 days, with its intercalary month Mercidonius every alternate year, was instituted, but it is probable it came from the Greeks who in 432 B. C. adopted the Metonic Cycle. Having made his changes, Numa placed the care of the calendar in the hands of the Pontifical College and whatever changes were made were made by it.

The calendar, as reformed by Numa and the priests, remained in force until again reformed by Julius Caesar in the year 46 B. C. Through the negligence of the Pontifical College 67 days had been lost which Caesar intercalated between November and December. As this year happened to be the year to which 23 days were to be added according to the regular schedule, the number of days in this year was 445, which caused it to be known as the year of confusion. Caesar employed Sosogines, an Egyptian astronomer, to make calculations of the annual course of the sun which was found to consist of 365 days and about six hours. A new calendar was formed and established by public edict, in which the first and every alternate month contained 31 days, and the remaining months 30 days, excepting February which contained 29 days, or 365 days for the year. Also the name of the month, "Quintilis," was changed to Julius and the calendar was known as the Julian calendar. In order that the six extra hours of each year should be provided for, Caesar directed that one day should be intercalated every fourth year making such year to consist of 366 days. This day was introduced between the 23rd and the 24th of February, which was called the sixth before the Calends of March, or the 23rd of February reckoned twice over by accounting these two days as one, whence the year which contained this day became known as bissextile, or twice six, which name it retains, although erroneously, to the present time.

Notwithstanding the carefulness of Caesar, the pontiffs made so great an error that Augustus Caesar, the nephew and successor of Caesar was obliged to reform the calendar again, concerning which Macrobius says, "The priests gave occasion to a new error by their intercalations. For whereas they ought to have intercalated that day which is made up out of the four times six hours, at the latter end of each fourth year and the beginning of the fifth, they made the intercalation at the beginning of each fourth year. This erroneous intercalation

was continued for thirty-six years together, in which space of time twelve days were intercalated instead of nine. This mistake was likewise corrected by Augustus, who ordered, that the following years should not be intercalated; so that these three days, which by the overhastiness of the priests, were overreckoned, might be swallowed up in this interval. Afterwards, he ordered, pursuant to Caesar's intention, that at the beginning of each fifth year one day should be intercalated, and that this order should, for an everlasting remembrance, be cut in brass."

Augustus also caused the name of the month, Sextilis, to be changed to Augustus, and in order that the number of days in this month should be equal to the number of days in Julius he deprived February of one of its days and added it to Augustus. In the calendar as reformed by Augustus, therefore, Februarius contains 28 days, Aprilis, Junius, September and November contain 30 days each, and the remaining months 31, and an extra day was intercalated according to the edict above. The Romans abolished in Asia, Egypt and all other countries under their sway the old method of reckoning by lunar years and compelled the adoption of the Julian calendar which was the generally recognized calendar for nearly sixteen centuries, when certain errors having been found the calendar was once more reformed. John Brady, in the *Clavis Calendaria*, described the change as follows: "Pope Gregory the Thirteenth, finding that, by the introduction of the Bissextile days, a difference had arisen of ten days between the calendar and actual time, owing to the odd minutes and seconds which the Bissextile year occasioned the calendar to exceed the true period of the sun's progress; and being desirous of celebrating Easter according to the original institution he, by the advice of Clavius and Ciaconius, caused those ten days to be abated in the year 1582, by having the 11th of March called the 21st, thereby making March to consist of 21 days only: and, in order to prevent the seasons of the year from retrograding as they had done before,

he ordained that three intercalary days should be omitted in every 400 years, by reckoning all those centurial years whose date consisted of entire hundreds not divisible by 4, or into hundreds without remainder, such as 1700, 1800, 1900, 2100, etc., to be only common years, and not Bissextile years, as they would otherwise have been. This correction was called the Gregorian or new style, in opposition to the Julian or old style; and has been adopted by almost every Christian nation, though it was not admitted into Great Britain until the year 1752 when the 10 days expunged by Gregory, and another day, which since his time had accrued, were taken out of the British calendar, and the 3rd of September reckoned the 14th, whereby that month consisted of only 19 days. The Gregorian style was immediately acceded to by all those parts of Europe which were under Papal authority, but the Protestants adhered to the Julian style with obstinate pertinacity, and the Protestants of Germany have the credit of having first rectified such inconsistency, by throwing 11 days out of their calendar in 1700; the Russian stills adhere to the Julian style and should they now adopt the Gregorian style, which they have decided to do, they will be obliged to drop 13 days from their calendar.

"As by this last regulation, the register of time has been brought so close to the actual solar year as not to amount to a day in about 5000 years, there is every reason to conclude that not any further improvements are hereafter likely to be attempted; and it is greatly to be hoped, that, without a reasonable prospect of material improvement, the venerable structure, with all its progressive advances towards perfection, may be left as it now stands."

The epoch of the reformed Julian calendar as reckoned by chronologists is January 1, 45 B. C. The birth of Jesus Christ is assumed for chronological purposes to have occurred on the 25th of December in the 45th year of the Julian era, and as by the Julian calendar January 1st was made the beginning of the year, the first

calendar year of the Christian era commenced seven days after the event which it nominally dates, or on January 1st of the 46th Julian year. The first century of the Christian era terminated therefore December 31st, 100, and the nineteenth century December 31st, 1900.

The various nations have differed widely as to the place among the seasons of the beginning of the year. The Roman year before the time of Julius Caesar began at the vernal equinox. The Greek year before the time of Meton began at the winter solstice; afterwards at the summer solstice. The Egyptian, Persian, and Jewish year began at the autumnal equinox. In England the year began on the 25th of March previous to the adoption of the Gregorian calendar which took place in 1752. The same usage prevailed in the British American colonies from Nova Scotia to Georgia and was abandoned at the same time.

As the power of the Roman Empire extended over nearly the whole of the then known world, the Julian Calendar, or at least that part of it which related to the political distribution of time, was in force in all parts of the empire. The Greeks substituted a solar for a lunar year and ceased from intercalating forty-five days in each Olympiad. The Egyptians were obliged to make their first day of the year, Thot, a fixed day rather than dependent upon the rising of a star, and the Jews abandoned their intercalation of one month in 120 years. In regard to religion, festivals, games, etc., no change was made and each nation followed its ancient customs. For instance, the Jews continued the ancient observance of the Law of Moses without change of the Sabbath, feasts or ceremonies, and the Pascha was observed on the fifteenth of March.

The first Christians adopted the Julian Calendar as regards the distribution of time, but celebrated their religious festivals very nearly on the same days as the Jews, although their reasons for observing these days were different from those of the Jews. They removed the eight Nundinal letters from the Calendar and sub-

stituted the seven Dominical letters in order to mark Sunday, the first day of the week, as the day of rest, rather than Saturday, the seventh day, which was observed by the Jews.

The first Christians were of the Jewish nation and celebrated Pascha not on account of the Exodus from Egypt, but because on that day they partook of the Last Supper with Christ. Later when people of other nations had adopted Christianity, there were two opinions in regard to the Pascha of Christ, one from life to death on the day of the crucifixion, and the other from death to life on the day of the resurrection. The Eastern Christians adopted the first opinion and celebrated it with the Jews on the fourteenth day of the moon of the first month, or the fifteenth of March, the day at that time beginning with midday. The Western Christians adopted the second opinion and celebrated it on the same day if it fell on Sunday, and if not, on the Sunday following. It was not until the middle of the second century of the Christian Era that both parties agreed to observe as Pascha the Sunday which fell on the fifteenth of March or immediately after. In the course of time the opinion arose that it was un-Christian to observe so important a festival on the same day with the Jews, and at the Council of Nice which was held in 325 A. D. it was decreed that the feast of Pascha, known to us as Easter, should be the first Sunday after the fourteenth day of the moon of the first month; but in case the fourteenth day of the moon fell on Sunday it should be held on the following Sunday, that is seven days after, declaring that the first month was that of which the fourteenth moon fell upon the day of the Equinox of Spring, or immediately after. It was also decided that the day of the Vernal Equinox was the twenty-first of March.

As the course of the moon was thus made the basis for determining the time of the Pascha, recourse was had to the lunar cycle of Meton from which was deduced the rule by which may be found the date of Pascha or Easter for any year.

It will therefore be seen that the discovery of the true length of the solar year as a basis for the measurement of the progress of time, required the labor of thousands upon thousands of men for centuries, and exacted the closest attention of the priests and philosophers for many generations. To make a proper arrangement of the divisions of time, adapted to the purposes of civil institutions, in other words to form a calendar, has occupied the talents of the wisest men, and it is not yet completed.

The month is a period of time derived from the motion of the moon. The "sidereal" month may be regarded as the period in which the moon, as seen from a fixed star, would appear to make a complete revolution round the earth; it is evidently the period in which she passes through the twelve signs of the Zodiac. Its mean value during the year is slightly in excess of 27 32/100 days. The "synodical" month, more commonly called the "lunar" month, or "lunation," is the period of time during which the moon goes through all her phases. It is usually reckoned from new moon to new moon; to complete the lunation the moon must not only pass through the twelve signs of the Zodiac, but also come again to occupy her old position relatively to the sun, which has itself advanced in the Zodiac, hence the lunar is longer than the sidereal month. The mean value of lunation is very slightly in excess of 29 53/100 days. The "solar" month is the 12th part of one solar year and is slightly more than 30 43/100 days. The "anomalistic" or irregular month is the period in which the moon passes from perigee to perigee of her orbit, the perigee being that position in the moon's orbit nearest to the earth. It differs from the sidereal month because the perigee varies its position.

The line of the nodes of the moon's orbit, the points where the moon intersects the ecliptic, or apparent path of the sun around the earth, varies its position, and the "nodial" month, or the period of her motion from ascending to descending node, differs from the other months mentioned above.

The lunar month was used by the Egyptians and Chaldaeans, and is still used by the Jews and Turks.

The twelve "civil" or calendar months of the year have from 28 to 31 days each. They are not equal divisions of the year, some April, June, September and November consisting of 30 days, and the remainder of 31 days, except February to which only 28 days are assigned, and the addition every fourth year of one more day.

These distinctions often give rise to much confusion as to the time intended to be designated by a month. In popular language it is often understood to be four weeks, as this is very nearly an equal period, expressed by weeks, to the month. This is even laid down by Blackstone as the legal definition of the term, so that a lease for twelve months is only for forty-eight weeks; but the expression of a "twelve-month" has been legally held to mean a solar year.

The term "week" is derived from the Latin *vicis*, by turns, one after the other; Gothic, *wiko*, a succession or change; Anglo Saxon, *weocu* or *wicu*, a week. As applied to time it designates generally a period of seven days. Although not founded on any natural phenomenon yet it was probably first instituted as a broad subdivision of the periodical month, corresponding to the four quarters of the moon.

At a very early period the Egyptians counted seven periodical days, naming them according to the seven planets then assumed. The application of the names of the planets to the days of the week in the order they now stand, originated in this way. It was an astrological notion that each planet in order presided over an hour of the day, the order, according to their distances from the earth, being in the geocentric system, Saturn, Jupiter, Mars, the sun, Venus, Mercury, the moon. Assuming Saturn to preside over the first hour of Saturday, and assigning to each succeeding hour a planet in order, the 22nd hour will fall again to Saturn, the 23rd to Jupiter, the 24th to Mars, and the first hour of

the next day to the sun; in the same way the first hour of the following day falls to the moon, and so on. The days were named from the planets which presided over the first hour and were known as Sun-day, Moon-day, Mars-day, Mercury-day, Jupiter-day, Venus-day, and Saturn-day. From Alexandria this seven days' week was imported, together with the individual days, to the Greeks, who had previously divided their months into three decades, and to the Romans, about the time of Christ. Rome had previously counted her periods by eight days, the eighth day itself being originally called Nundinae, a term later applied to the whole cycle, on which day the country people were in the habit of coming to town for the purposes of business, to inquire after public news, the changes in government and legislation, vacant places, and the rest. The seven days' cycle soon found great favor among the Romans although the change was not introduced before Constantine.

The Jews as well as the early Christians had no special names for the single days, but counted their number from the previous Sabbath, beginning with Sunday as the first after the Sabbath, and ending with Friday as the sixth after the previous Sabbath, or Eve of the next Sabbath, or the seventh day, it being called the Sabbath from the Hebrew *shabath*, to rest, and designates the seventh day of the week, set aside in the Old Testament, as a period of cessation from work.

Whether the Sabbath was an institution of pre-Mosaic times or was purely Mosaic is an open question. The division of the week into seven days antedated the time of Moses, but the celebration of the seventh day as a day consecrated to Jehovah is first mentioned after the Exodus from Egypt (Exodus xiii, 6; xx : 8-11.) The Jewish name "Sabbath" came into use in Rome and from it spread all over the Roman empire.

At what date the Sunday, or the first day of the week began to be generally used by Christians as a stated time for religious meetings is not definitely known, but whatever may have been the opinion and practice of

the early Christians in regard to cessation from labor on Sunday, unquestionably the first law, either ecclesiastical or civil, by which the sabbatical observance of that day is known to have been ordained, is the edict of Constantine, 321 A. D., which reads: "Let all judges, inhabitants of the cities, and artificers rest on the venerable Sunday. But in the country, husbandmen may freely and lawfully apply to the business of agriculture; since it often happens that the sowing of corn and planting of vines cannot be so advantageously performed on any other day; lest, by neglecting the opportunity, they should lose the benefits which the divine bounty bestows on us."

It is curious to notice how the names of the five days of the week which followed those named after the sun and moon, became Germanized, as it were, or the names of the originally imported gods translated into those of the Germanic divinities. Thus the day of Mars, the *dies Martis* of the Romans, became Tyrsdag among the Germans, the god Tyr being in German the same as the god Mars in Latin, namely the god of war, and the third day of the week was called Tuesday. The fourth day, the day of Mercury, became Wednesday, being named from Wodan, or Odin, the chief of the gods. Jupiter's day, the fifth day, was changed to Thor's day, or Thursday, from Thor, the god of thunder. The sixth day, the day of Venus was named Friday in honor of Freya, the wife of Odin. Saturn's day, being the seventh day was called Sanstag or Sabbath day.

Speaking generally, with the ancients as with us, a day was the name applied to the time during which, apparently, the sun performed his course around the earth. This, however, is not exactly true. It is not a complete rotation of the earth which makes a day in its usual sense. If the time is noted when a particular fixed star is exactly on the meridian, when the same star comes again to the meridian the next day, the earth has made exactly one rotation, and the time that has elapsed is called a sidereal day. This portion of time is always

of the same length and on account of its unvarying uniformity sidereal time is much used by astronomers. The passage of a star is not conspicuous enough to be used in regulating the affairs of men in general. It is not a complete rotation of the earth, but a complete alternation of light and darkness that constitutes their day. This is called the civil or solar day and is measured between two meridian passages of the sun, and is about four minutes longer than the sidereal day, which is due to the movement of the earth in the ecliptic. With the Babylonians the civil day began with the rising of the sun; with the Greeks with the setting of the sun; and with the Romans with midnight.

The time between the rising and the setting of the sun was called the natural day and in very early times the Greeks divided the natural day into forenoon, midday, a period during which the sun was supposed to stand still, and afternoon. The Romans divided the natural day into antemeridian and postmeridian, meridian being considered the point at which one ended and the other began. It was one of the duties of an officer known as an *accensus* to proclaim the time of midday when from the Curia he saw the sun appearing between the Rostrum, where orators harangued, and the spot called the Station of the Greeks, where ambassadors stopped when deputed to the Senate. This was the nearest approach made by the Romans for ascertaining the hour for centuries. Although time was early divided into years according to the motions of the sun; into months according to the moon; and into days by the alternation of light and darkness, yet it was long before any accurate measure was found for a division of the day itself.

As the Greeks divided their month into three parts and reckoned each day as such a part of a decade, so the Romans divided their month into three parts and reckoned the days by Calends, Nones, and Ides.

The month always began upon the first day of the moon. Therefore, at the first appearance of the new moon, one of the pontifices assembled the people in the

Capitol near the Curia Calabria and there called over as many days as there were between that and the Nones whether five or seven, by so often repeating the word "calo," and from this word "calo," I call, this day received the name of Calends, and that which was to be called became known as Calendar.

On the Nones the country people assembled for the purpose of learning from the Rex Sacrorum the various festivals to be celebrated during the month, and the days upon which they would fall. In like manner all who wished to go to law were obliged to inquire of the privileged few on what day they might bring their suit, and received the reply as if from the lips of an astrologer.

The ability to give this information was long a source of power and profit to the priests who jealously guarded the secret of their information and surrounded it with a veil of mystery.

The calling of the Calends, and the announcing by word of mouth of the festival and Court days continued until 304 B. C., when Cneius Flavius, a curule aedile, and scribe to Appius Claudius, censor, having gained access to the pontifical books copied out all the requisite information, had it engraved on tablets, and hung them up in the forum for the use of the people at large.

From this time such tables became common and were known by the name of Fasti. They contained an enumeration of the days and months of the year, Nundinae, Dies Fasti and Nefasti, astronomical observations on the fixed stars, prophecies on the weather, notices of glorious victories, etc. Indeed they varied but little from the modern Ecclesiastical Calendar.

In early times the Calends of March, but after the adoption of the Julian year in 45 B. C., the Calends of January, was more solemn than the Calends of any of the other months. It was New Year's Day. It was the day upon which the magistrates entered upon their office. On this day friends wished each other good fortune and interchanged presents. It was also the day upon which debtors were obliged to pay interest upon

their debts, and settle their accounts, hence according to Horace "tristae calendae." The interest or account book was called "calendarium."

The "Nones" took their name from being the ninth day before the Ides reckoning inclusively. In March, May, July, and October the Nones fell on the 7th and the Ides on the 15th of the month; in the remaining months the Nones fell on the 5th and the Ides on the 13th.

According to Macrobius the name "Ides" was derived from the Etruscan verb *iduo*, I divide, because it divided or nearly halved the month. Days were reckoned as so many days before the Nones, Ides, or Calends, reckoning inclusively.

The division of the natural day into twelve equal parts was adopted by the Romans about 291 B. C., when L. Papitius Cursor erected in the Court of the Temple of Quirinus a *solarium horologium* or *sun-dial* which he had taken in the war with Pyrrhus. As this sun-dial had been made for a different meridian and could be used only in the day-time when the sky was clear, it marked the time at Rome very imperfectly.

About 157 B. C., Scipio Nasica introduced the clepsydra or water-clock, the principle of which was very similar to what we know as the sand hour-glass, which was of the utmost utility as it could be used in all weathers, by night as well as by day. The clepsydra of Scipio Nasica is described as follows by Pancirollus. "They took a vessel made of glass, in the bottom of which was a narrow hole done about with gold, lest the water should wear it away: on the other part of the vessel was drawn a right line having the twelve hours set upon it, after which they filled the vessel with water, which issued drop by drop out of the little hole; in the water was a cork with a pin stuck into it, and the point of that pin turned to the first hour when the glass was full and to the other hours in proportion to the gradual decrease of the water." It was also about this time that the twelve equal parts of the day were called hours. As the

natural day was constantly changing in length, the length of these hours changed every day. At the summer solstice, when the natural day contained about sixteen of our hours, the hour contained seventy-five minutes; in the winter solstice when the natural day contained only about eight of our hours, each hour contained forty-five minutes. The present system of making a day to extend from midnight and of dividing it into twenty-four equal parts regardless of daylight or darkness was adopted about the end of the fourth century A. D., and the first calendar in which we find the duration of day and night marked according to equinoctial hours, is the "Calendarium Rusticum Farnesianum."

Both the sun-dial and clepsydra were invented in the East and had been in use from very early times among the Egyptians. The first mention of the sun-dial is in the Bible, II Kings, 20th chap., 11th verse, which reads: "And Isaiah the prophet cried unto the Lord: And he brought the shadow ten degrees backward, by which it had gone down in the dial of Ahaz." Also the 8th verse of the 38th chapter of Isaiah reads, "Behold I will bring again the shadow of the degrees, which is gone down in the sun-dial of Ahaz, ten degrees backward. So the sun returned ten degrees, by which degrees it was gone down." Ahaz, the father of Hezekiah, the king of Judah, died about 726 B. C.

The time of the invention of the clepsydra is unknown, but it was in common use in the time of Aristophanes, who was born about 444 B. C.

But previous to the sun-dial and clepsydra the ancients used the gnomon, which is the earliest and simplest instrument for measuring the time of day which has been mentioned. It was a staff or pillar standing perpendicularly in a place exposed to the sun so that the length of its shadow might be easily ascertained. The shadow was measured by feet which were marked on the place where the shadow fell. By whomsoever the gnomon was invented, and Herodotus gives the credit to the Babylonians, from that day to the present it has

been the proper method for determining the hour of the day. Any person who is employed in the open air, whether hunter, farmer, backwoodsman, sailor or soldier, whether white man, Indian, or negro, can usually tell the time of day by means of the length and direction of the shadow of a staff cast by the sun. Many can tell the hour of the day by standing with their backs to the sun and noting the length and direction of their shadows. It is reported that in 1100 B. C. the Chinese astronomers found the length of the shadow of a gnomon at the summer solstice was one foot and a half, the gnomon itself being eight feet long. Pliny recorded that the shadow of the dial which they call the Gnomon in Egypt, at noon tide on the equinoctial day, is little more in length than half the gnomon. Augustus erected a gnomon 100 feet high in the Campus Martius. "The English Chapman's and Traveler's Almanack for 1712" gives a rule and table by which the hour of the day may be found by means of a staff. In John Wing's "*Olympia Domata*" and Salem Pearse's "*Celestial Diary*," both almanacks for the year 1722, the rule and table are repeated. They are again found in an almanac for 1765 entitled "*Poor Richard Improved. By Richard Saunders, Philom. Philadelphia: Printed and Sold by B. Franklin and D. Hall.*" As the rule in each almanac is given in almost the same words it is evident that it is but a copy of some very old rule. According to the table in "*Poor Richard Improved,*" the staff, which was ten feet long, on the 21st of March at 12 o'clock, noon, cast a shadow seven feet long; on the 21st of June, 3 feet long; on the 21st of September 9 feet long; and on the 21st of December 19 feet long. At six o'clock, either morning or afternoon of the 21st of March the shadow was 192 feet long and on the 21st of June at the same time it was 38 feet. On the 21st of September at 7 in the morning or 5 in the afternoon the shadow was 63 feet long and on December 21st at 8 in the morning or four in the afternoon it was 100 feet. The length of the shadow was shortest at the summer solstice; gradually

increased until it reached its greatest length at the winter solstice, and then gradually decreased until the summer solstice was reached.

The wisdom of man was continually exercised in trying to find some mechanical device for measuring the passage of time and the clepsydra was succeeded by a clock impelled by weights or springs and regulated by toothed wheels. But of this invention the Romans were entirely ignorant. It is attributed to Pacificus who lived in the ninth century A. D. It was not, however, until about the 13th century that the invention became practically useful. A very great advance in clock making and the measurement of time reduced to the greatest precision was caused by the discovery of the pendulum by Galileo about the commencement of the 17th century, and its application to clocks about the middle of the same century. The first pendulum clock made in England was in the year 1662 by Mr. Fromantil, a Dutchman.

When watches were first used is not known. Watches were made in Nuremburg by Peter Hele as early as 1490 and were called "Nuremburgh Eggs" on account of their oval shape. But it is claimed that the watch as we know it was invented as recently as 1658 and its invention is claimed for Dr. Hooke and Mr. Huygens. Great improvements, however, have been made and watches are now made with such extreme accuracy as to vary only a few seconds in the year, and those made at Waltham, Mass., are not surpassed by any other make.

As in early days the calendar was under the control of the priests it is not unlikely that an annual calendar containing a list of the months, weeks, and days which is so common with us was engraved, written, or printed, but if so no copy has been brought to my attention.

Of almanacs we have examples from very early times. The pastoral life of the Egyptians, Chaldæans, Babylonians and Arabians predisposed them to a belief in astrology and no operation of daily life was performed

without first consulting the stars. To satisfy this demand for celestial knowledge almanacs, or books giving general information and advice upon the movements of the heavenly bodies were common in the Egyptian and Arabian world, and this form of literature has spread over Christendom.

These books, however, were not known as almanacs. Roger Bacon used the term "almanac" as early as 1267, but whether or not he was the first to use that term does not appear. Previous to his time the register was known as "Computus," "Martyrologium," "Calendares," and "fasti." As the "computus" contained the Eastern tables, a list of the Saints' days, and the various Fast and Festival days, is was indispensable to the officers of the Church and from the year 325 every cleric was expected to know his "computus."

These registers were not annual registers but what we call perpetual almanacs, or an almanac so devised that it may be adjusted for any particular year. The annual almanac seems to have been first made for the use of navigators who did not venture far into the open sea, but kept in sight of the coast or some island, which served as guides in the daytime; in the night-time the position, the rising and setting of the different stars, answered the same purpose, and tables were found in the "ephemeris" which is an ancient Greek term for an astronomical almanac, or a book giving the computed places of the heavenly bodies for each day in the year.

One of the earliest of these registers or almanacs is the "Papyrus Sallier, No. IV," published in facsimile in "Select Papyri, Vol. 1." The papyrus itself is in the British Museum. About one third is missing, but the remaining portion contains eight months of the year. The author, a contemporary of Rameses II, by making extracts from the works of other writers has compiled an almanac in which every day of the year has marked against it its good and evil virtues, that is, it was a register of lucky and unlucky days throughout the year.

Rameses II is supposed to have reigned in the thirteenth century.

The hours between the rising and setting of the sun, the only ones that are of importance, are divided into three seasons of four, each of which is ruled by its particular influence. Most often their quality was the same and the whole day was placed in the category either of propitious or fatal days. Sometimes, however, it happened that one of the periods had one value, while another assumed another value, and there were also mixed days on which fortune differed every minute. The writer has carefully registered these oscillations and has placed a warning note for the reader after each date, as good, good, good, or hostile, hostile, hostile, or good, good, hostile, or any combination to which the division into three groups lends itself. Afterwards he indicates the things to be done or avoided, the animals whose encounter or sight should be shunned, injunctions with regard to fire, precautions for guarding against the evil eye, and adds to this information a summary of the motives which justified his recommendations. It was in almost every case a legendary episode of the gods. We perceive that a victory or some pleasant experience of one of the immortals at that particular date and hour had some undefined effect upon mortals and gave them a chance of prosperity. On the other hand, the consequences of a disaster in heaven would make themselves felt on earth for a long period of time; thus men were benefited or injured by the pleasures or misfortunes of the gods. So many injunctions and so many warnings were given, and so many methods offered by which calamity could be averted, that it is not to be wondered at that the almanac was consulted on all occasions.

The influences whether good or bad were always exerted on fixed days of the month, regardless of the day of the week on which the date might fall. For instance, on the eleventh of Tobi no one might approach the fire place, for the god Ra had once burst into flame on that

day in order to devour his enemies and the effects of his metamorphosis was felt each anniversary, and even at the present day the superstition still holds among the Egyptian peasants who will neither kindle a fire, approach a flame, or smoke on that day.

As all of these influences were exerted on a certain day of the month regardless of the day of the week upon which that date fell, the almanac was good for any and all years. Just as we celebrate Independence Day on the fourth of July, Sunday excepted, so fire was to be avoided by the Egyptians in the times of Rameses II on the eleventh of Tobi.

Another early almanac is the one engraved on the ceiling of the Temple of Denderah in Egypt which represents in hieroglyphics the yearly journey of the sun between Cancer and Capricorn and return. Apparently all the signs of the Zodiac are represented as well as the nineteen years of the Metonic cycle, and the festival days. The age of this temple is much disputed, but recent discoveries would seem to indicate that it was built about 35 A. D.

That the representation of the twelve signs of the Zodiac has been a favorite subject for artists from that time to the present is fully shown by James Fowler in his beautiful quarto volume "On Mediaeval Representations of the Months and Seasons. London, 1873," in which he describes one hundred examples taken from the porticos, ceilings, windows, and tiles of cathedrals and churches in Great Britain and France, covering the period from the tenth to the eighteenth century. In his introduction he says "none of the phenomena of nature can earlier, or more widely, or more deeply have attracted notice and curiosity than the phenomena of the Seasons; and none, probably, earlier or more widely became embodied in art and poetry. For that reason few subjects, probably, would prove of greater interest in themselves, or in the light which they have reflected, incidentally, on the life and thought of those who have gone before us, if undertaken by an accomplished antiquary, than the enumeration, and description, and

comparison of the different modes of representing the Seasons employed in different countries and ages from the earliest to the latest times . . . . It would seem that in the middle ages, whether in illuminated manuscripts, early printed books, clogg almanacs, cut stone, carved wood, metal work, incised pavers, encaustic tiles, mosaics, wall paintings or painted glass, representations of the months and seasons were of frequent occurrence. For each month the custom was to represent the corresponding sign of the Zodiac, or some characteristic symbol or occupation, or both, with or without the month or other inscription. The seasons were usually represented by symbols or occupations only."

The Roman Fasti closely resembled a modern almanac and the celebrated "Fasti" of Ovid may be considered as a poetical "Year Book" or "Companion to the Almanac" having been composed to illustrate the Fasti published by Julius Caesar, who remodelled the Roman year. All the more remarkable epochs are explained in succession, the origin of the different festivals explained, the various ceremonies described, the legends connected with the principal constellations narrated, and many curious discussions interwoven upon subjects likely to prove interesting to his countrymen.

Several specimens of Fasti, on stone or marble have been discovered at different times in different places, but none of them older than the age of Augustus. One of the most remarkable is that known as the "Kalendarium Praenestinum" or "Fasti Verriani." Seutonius tells us that a statue of Verrius Flaccus, preceptor to the grandsons of Augustus, stood in the lower part of the Forum of his native town Praenesti, on which he had exhibited to public view the Fasti arranged by himself and engraved on marble slabs. In 1770 the remains of a circular building were discovered in the immediate vicinity of the modern Palestina, together with several fragments of marble tablets which were soon recognized as forming part of an ancient calendar. Farther examination showed that these were the Fasti of Verrius.

In the Naples Museum is preserved an ancient Roman Farmer's Calendar or Rural Almanac known as the *Calendarium Rusticum Farnesianium.* It is inscribed upon the four sides of a cube of marble about two and one-half feet in height, and a foot and a half in length and breadth, each face being divided into three columns, and each column including a month. At the top of each column is carved the appropriate sign of the Zodiac; then follow the name of the month, the number of the days, the position of the Nones, the length of the day and night, the name of the sign through which the sun passes, the god under whose protection the month was placed, the various agricultural operations to be performed, and a list of the principal festivals. The resemblance of the various modern Farmer's Almanacs to this ancient Farmer's Calendar is very striking.

A very interesting but more modern almanac is what is known as The Mexican Calendar Stone. It is an enormous slab of basaltic porphyry about twelve feet square and three feet thick which has been cut from a quarry in the neighborhood of the city of Mexico. The disc is wrought from this great stone, stands out in relief from the surface of the block about nine inches, and is eleven feet, eight inches in diameter. After having been suitably engraved by the sculptor this slab was sunk in the surface of an altar which had been erected upon the platform of an immense pyramidal structure which had been built in the great square of the city as a temple to the Aztec god, Mixitli. The sculptor has covered the surface of the disc with hieroglyphic pictures the lines of which have been cut to a depth of more than seven inches. These pictures have been deciphered and prove to be a very successful attempt to preserve in stone the Aztec idea of the division of time. The central tablet represents the face of the sun-god and from the manner in which it is engraved the artist intended to represent that god as the creator, the giver, the divider of time, the very oldest being that ever existed. Around this central tablet in concentric zones are other tablets which repre-

sent the day, the week, the month, the year, and the cycle. At the top of the disc, in the outer zone, over the central tablet is the symbolic representation of the year in which this work of art was made and consecrated, namely 1479, and it is claimed[1] that other symbols show the dates of important events in Aztec history.

Although attributed to the Aztecs it is very probable that the calendar represented here was formed by the Toltecs, a very superior race, who, coming from the North, conquered the people then inhabiting the country, and remained here from the seventh to the twelfth century, laying the foundations of social, political and religious order, and building sumptuous temples and palaces.

Early in the thirteenth century, they either migrated farther south or were driven by other nations from the north among which were the Aztecs, who were the most powerful, and apparently exercised common dominion over all the others until conquered by the Spaniards in 1521.

The Aztecs built a great city, on whose ruins is now the City of Mexico, in which was the temple of which the Calendar Stone was an important feature, as on it thousands of human victims were sacrificed whose blood was thought to conciliate the anger of the gods. The temple was destroyed by Cortes and the stone after having been placed on exhibition for several years in the Market-place was in 1561 buried where it had stood. It was resurrected in 1790 and built into the walls of the cathedral, where it may now be seen.

Calendars made of gold and silver were common in Mexico. Before Cortes reached the capital Montezuma sent a deputation of noblemen to meet him carrying a magnificent present of articles beautifully wrought of gold and other costly materials. Among them two wheels, one of gold with the image of the sun, and the other of silver with the image of the moon upon it, both formed of plates of these metals each twenty-eight hands

[1]Philipp J. J. Valentini, Ph. D.

in circumference, with various figures of animals and other things, in *basso relievo*, finished with great ingenuity and skill. The Aztecs represented their division of time by means of wheels and these two wheels were calendars.

They calculated their civil year by the solar; they divided it into eighteen months of twenty days each, and added five complimentary days, to make up the complete number of three hundred and sixty-five, after the last of these months: the five "nomentemi" or "useless days" were intercalated, and belonging to no particular month, were regarded as unlucky by the superstitious natives.

Their week consisted of five days, the last of which was market-day, and a month consisted of four of these weeks. As the tropical year is composed of about six hours more than three hundred and sixty-five days, they lost a day every fourth year which they supplied, not at the termination of that period, but at the expiration of their cycle of fifty-two years, when they intercalated the twelve and a half days that had been lost.

It is in only the first year of the cycle that the Mexican year corresponds with our year. For instance, the first day of the first year of the Mexican Cycle in the year 1454 corresponds with December 31 of the Julian year old style, or January 9, new style. For on account of our intercalation of one day every fourth year, the Mexican year receded as compared with ours one day every four years. This correction therefore must be made when a comparison of dates is wanted for any other year than the first year. The Mexican intercalation of thirteen days at the end of fifty-two years made again the first year of every cycle correspond with our year.

The question naturally arises, how the Toltecs became so far advanced in civilization as to be able somewhere between the seventh and the twelfth century of the Christian Era to formulate a calendar which the Spanish conquerors in 1521 found to be as accurate as their

own, and how the Aztecs were able to solve such problems in engineering as the transporting of a huge stone block, many tons in weight, over miles of marshland and river, and the elevating and placing it on a platform 120 feet in height.

In "Clavis Calendaria" John Brady says, "Those immense square pillars or obelisks in Egypt, the hieroglyphical characters upon which have so much perplexed the learned, have been considered as containing directions for the monthly rural labours of the Egyptians and consequently to have been the first species of almanac ever issued; and when the repetition of the same figures or characters on each of those vast pillars is considered, the titles assigned to them by the Egyptian priests "fingers of the sun," to which orb they were usually dedicated; and the nature of the stone of which they were composed, being of various colours, and regarded as typical of the four elements; there is good reason for concluding that they were intended as almanacs rather than histories of sovereigns, or for any other uses that have been assigned them by the ingenuity of antiquaries."

As early as the eleventh century our English ancestors used as an almanac an instrument of somewhat similar form, although a very humble imitation. I refer to what we call "Cloggs" but which among the Danes, Swedes, and Norwegians were known as "Runstocks," "Runstaffs," etc. Mr. Brady says "they were introduced into England at the Norman Conquest. Before printing was introduced, and when manuscripts were scarce and dear, these Runic almanacs were particularly useful in assisting the memory. In all visits to distant churches, in all pilgrimages, etc., they were made the instruments of instruction and regularity; and that they might be doubly serviceable, they were frequently carved on the tops of pilgrims' staves, so as to regulate their times of assembling at particular places and also to support them in their wearisome journeys. These Runic almanacs, like others in manusrcipt, bore the

characters of pagan superstition until about the fourth century when they partook of both heathen and Christian emblematic devices, so as to be more generally saleable; but after the seventh century, they became wholly Christian, and that they might be made as universally serviceable as possible, they were sometimes cut on sword scabbards, implements of husbandry, etc."

Although the Greeks of Alexandria are said to have constructed written almanacs in the second century of the Christian era and manuscript almanacs must have been quite common, yet there is no record of any now extant previous to the twelfth century.

An early manuscript almanac is one written in the year 354 A. D. It was written on parchment and contained about fifty leaves. Romulus Huart (b. 1537—d. 1613), utriusque juris licentiatas, writes that "*fastos quosdam seu calendarium Romanum antiquis plane characteribus in membrana sex (si bene memini) foliorum descriptum, sex etiam dumtaxat menses complectens*" was in 1560 in the possession of his father-in-law John Brenner, royal secretary and actuary of the Provincial Council of Luxemburg. It passed through various hands until in 1627 it was in Brussels in the possession of Peirescius who wrote to Peter Dupuy, the publisher, May 12, 1627, "*Parceque je desire de faire imprimer ce calendria Constantinien MS. (avec les fastes et martyriologes qui y sont joincts) lequel vous avez veu aytres fois je vous supplii de ne pas laisser sortir de vos mains le coppie au memoires que vous en pourriez avoir tirees, etc.*"

From that time to the present no trace of the calendar has been found. Copies of the original pages and of other portions of the whole Calendar had been made at various times, and by diligent searching Mr. Mommsen had been enabled to reconstruct the Calendar which he calls "Chronographus Anni, CCCLIIII, and" which was published in "Monumenta Germanica Historica." Chronica Minora. Saec. IV, V, VI, VII. Edidit Theodorus Mommsen. Volumen I, Bucolini 1892. It was divided into thirteen sections, viz:

I. Dedicatio Valentino.
II. Imagines urbium Romae Alexandriae Constantinopolis Treverorum.
III. Dedicatio imperatoria et natales Cæsarum, in his d(omini) n(ostri) Constantii.
IV. Imagines Planetarum VII laterculo norarum noxiarum communium bonarum.
V. Signa zodiaci eorum utilitates.
VI. Imagines mensium cum hemerologio, in quo item adnotatur natalis Constanti.
VII. Imagines imperatorum duorum alterius sedentis et diademati cincti (a Constantio Augusti figlio di Constantino) alterius diademati stantis (Constantio Caesare Gallo.)
VIII. Fasti consulares ad a. p. Chr. 354.
IX. Cyclus paschalis ab a. p. Chr. 312 as a. 358 cum continuatione perturbata finiente a. 410.
X. Laterculus praefectorum urbis Romae as. a. p. Chr. 354.
XI. Depositiones episcoporum Romanorum quorum ultimus est Julius a 352.
XII. Feriale ecclesiae Romanae (depositiones martyrium).
XIII. Laterculus episcoporum Romanorum finiens in Liberis qui adiit a. 352.

Complete lists of these tables are given in *Chronica Minora.*

In regard to this almanac Mr. C. W. Ernst, the well known antiquary of Boston wrote to me the following letter:

298 Commonwealth Avenue, 17 December, 1906.

Dear Mr. Littlefield:—

The clog you gave me is quite clear, now that I have looked at it under your guidance. With a Catholic almanac all turns out right.

The Filocalus, or Liberius, almanac of 354, in Chronica Minora, ed. Mommsen, I (1892), pp. 39-148, was first printed, 1634, in Bucherius, Doctrina Temporum (Antwerp); and Mommsen published it again in 1850. In a sense, then, it is ancient history, by the side of which the Gothic fragment of the 4th century (?), found by Mai, is not to be mentioned. This Gothic scrap has our word "yule," meaning "jolly season."

The Liberius almanac of 354 is the earliest Christian almanac known, not likely to be excelled. It came in the very heart of the 4th century controversy between Unitarians (Arians)

and Catholics. It has the dominical and nundinal letters, the Easter cycle, a list of Saints' days, and stands first in assigning Christmas to the 25th of December. These latter points give the almanac present interest, and make me think that no man save Pope Liberius could have issued the document.

Up to that time there was no special celebration of the nativity; what there was took place on the 6th of January, Epiphany. In 354 a new festival of the first order was introduced, and the non-movable part of the church year was established. All Christendom has accepted the almanac of 354. The Pope who took this step was not unfriendly to pagans, and his beginning of the year on the 25th of December generally prevailed through the Middle Ages. English mediaeval chronicles frequently begin the year on the 25th of December. Roger Howden may be given as an example. The novelty of the almanac, its influence, and especially its list of holidays, strengthen the belief that Pope Liberius was its real source. Filocalus was only the scribe, I think, chosen by Liberius. And other reasons might be named for calling it the Liberius almanac of 354. Liberius had the best of reasons for issuing just such a document, and the year is not an accident. A little later Liberius carefully compromised with Unitarians. It is plain that we of Boston in 1906 celebrate Christmas on the 25th of December, because Liberius established that festival in 354.

Always yours,

C. W. Ernst.

In the Savilian Library at Oxford is a manuscript almanac published by Petrus de Dacia about 1300 A. D. He was a believer in astrology and has been credited with being the originator of the *homo signorum*, the man of signs. This, however, is a mistake as diagrams of the stars with descriptive hieroglyphics taken from ancient temples and tombs indicate most positively that the early Egyptian system of studying the stars was by noting their hourly position above and around some huge figure like the sphinx, so that the varying positions "over eye, heart, elbow, etc.," could be intelligently recorded for different times, and arguments discussed, as well as theories framed therefrom. The similarity of the figure in the Egyptian diagram and the "man of signs" in the modern almanacs is very striking.

Even at the present day the "Anatomy" as the "man of signs" is called is a familiar figure in a few of the almanacs, as it has been for centuries in many of the more prominent almanacs. It is the figure of a man surrounded by the twelve signs of the zodiac with daggers pointing to the parts of the body which the signs are supposed to govern as the moon passes them.

In "Fly. An Almanack for the Year of our Lord God, 1722," a whole page is devoted to the "*homo-signorum.*" The figure itself occupies the middle of the page and is surrounded by printed descriptions. The legend at the top of the page reads, "The Anatomy of the Body of Man, as the Parts thereof are governed by the Twelve Constellations of Stars in the Zodiack, or rather the Moon passing by the same Constellations." In each monthly table one of the columns shows what part of the body is influenced by the moon on every day of the month. Although most of the almanacs contained the monthly column of Moon's sign yet they did not all of them contain the Anatomy. In a bound volume containing eighteen almanacs for the year 1722, fifteen contained the monthly column, but only six contained the Anatomy. The pointing out proper days for bleeding, taking physics, and other odd matters seems to have been one of the important parts of the task of the almanac compilers. Many well-meaning persons would not willingly adopt a remedy for disease without previously consulting that mystical column in the Almanac devoted to *knees*, hams, legs, ankles, feet, etc., it being considered unlucky to take medicine of the sign which influenced that part of the body on that day was not propitious. The following story is related: In the latter part of the eighteenth century a famous physician sent physic to a patient desiring him to take it immediately. On the following day he called upon the patient and inquired how it had operated. The patient, a farmer, replied he had not taken it. Upon the physician's remonstrating against this disobedience the patient replied, "I looked into the almanac and seeing the sign lay in

the bowels I thought that and the physic together would be too much for me."

In "Merlinus Liberatus for 1761," by John Partridge, the table of the moon's sign is advertised as "being of excellent use for the direction of any person that deals in cattle, etc. It being so plain and easy that it requires no more explanation, for its use is exhibited by inspection." Although Partridge died in 1714 yet the almanac was published with his name attached as author for more than one hundred years after his death, but to his name was added the legend "*etiam Mortuus loquitur.*" He was a shoemaker by trade, but by employing his leisure moments in study, acquired a knowledge of latin, astronomy, astrology, and physic, and in 1688 began the publication of an almanac. He acquired considerable renown from an attack on him by Dean Swift, who under the name of Bickerstaff published several satirical and humorous pamphlets against the "shoemaker astrologer."

Notwithstanding its absurdity the public resisted attempts to eliminate the anatomy from the almanacs. The Stationers Company once tried the experiment of omitting the column of the moon's influence on the parts of the body from *Vox Stellarum* by Francis Moore, but so many copies were returned upon their hands that they were obliged to insert it the next year. On the titlepage of the second part of *Old Poor Robin, 1816* is a woodcut of the Anatomy under which is printed,

> Above is a figure will puzzle your brains,
> The more 'twill bewilder, the more you take pains;
> If you take my advice, you will let it alone,
> For indeed it is useless when thoroughly known.

Among the authors of the manuscript almanacs were Solomon Jarchus, A. D. 1150; Roger Bacon, 1292; Walter de Elvendene, 1327; John Somers, 1380; and Nicolas de Lynner, 1386. Although independent manuscript almanacs are uncommon, yet an almanac is almost sure to be found in the early manuscript Books of Hours and Prayer Books. It is called the Ecclesiastical Calendar

and in addition to the simple calendar contains "Tables and rules for the moveable and immoveable feasts, days of fasting and abstinence, Easter-day, dominical or Sunday letter, and the golden number." To correspond with the rest of the book the pages of these calendars or almanacs were beautifully written in black and red text, and were surrounded with illuminated borders, jeweled with gold, in which were represented fruits, flowers, birds and animals. In many of the "Books of Hours," several of the miniatures executed by famous artists, indicate the labors and exploits of serfs and nobles in the four seasons. In the August, 1906, number of *Scribner's Magazine*, Mr. A. B. Frost, an American artist, has followed this idea by presenting four pictures in colors representing the labors of a farmer and which he entitles "The Farmer's Seasons." Naturally these manuscript books are much sought for and fine copies bring thousands of dollars.

Besides being written in book form, the almanac was also written on separate pieces of paper and folded in the shape of a flat stick or lathe.

Probably the first printed almanac is what is known as the *Calendar of 1457*. It was printed in Mentz by Gutenberg, in the new printing office which he had opened after his lawsuit with Fust. It was printed on one side of the sheet with type of double pica body, obviously made to be posted or hung upon the wall. Only the half of a single copy is extant. It contains the festivals and notable days for six months. Gutenberg also is supposed to have printed *An Almanac* for 1460, a quarto of six leaves, printed with a type of round Gothic on English body, with head lines in types resembling the text types of the Bible of 42 lines.

Johann Muller, a German mathematician and astronomer, a pupil of the famous astronomer Purbach, who published manuscript almanacs, a native of Königsburg, from whence he received the name of *Regiomontanus*, its Latin equivalent, compiled an almanac which appears to have been the prototype of all the almanacs which

have followed it. It contained the golden number, the motions of the sun and moon, days of the weeks, months, and year, and astrological tables. In 1471 Muller went to Nuremberg where he attracted the attention of a wealthy and intelligent citizen, Bernard Walther, who assisted him in starting a book-printing establishment. He is said to have printed his *Kalendarium Novum* in 1472. No copy of it, however, is in existence. The earliest copy known, containing title-page and date, was printed in Venice in 1476 by Bernard Pictor, Petrus Loslein, and Erhardus Ratdolt. Muller died 6th July, 1476 and as this book came out just before his death it is presumed to have been the first edition, especially as Muller had removed from Nuremberg to Rome. It contains twelve leaves. On the recto of the first leaf is the title, surrounded on three sides by an elegant border in black; the bottom being filled up in the middle with the names of the printers, etc., in red, the vacancy at each end having an ornamental knot in black. As a running title it has the ornamental K L, the beautiful capitals are formed of the branches and foliage of trees, and the words and figures are printed in red. The whole appearance of the book shows it to be a monument of the typographical skill of the Venetian printer, Erhardus Ratdolt, one of the most wonderful masters of the art of printing during the fifteenth century, and one of the earliest to introduce wood engraving into books. His work was famous for the beauty of the types and illustrations. As far as known this almanac has the honor of being the first book which contains a complete as well as an ornamental title-page, giving the place and date of publication and names of the printers, with no other peculiarity than the fact of the contents of the book being stated in verse instead of prose. It is a curious fact that it was at least twenty years before a full title-page appeared in any other book and title-pages did not become common until 1520. An almanac was printed at Ulm in 1478, at Barcelona in 1487, and at Vienna in 1491. The earliest English almanacs were printed in

Holland on small folio sheets. Several of these have been preserved from having been used as stuffing in the covers of books. The earliest almanac known to have been printed in England was *The Shepheard's Kalendar*, translated from the French and printed by Richard Pynson in 1497. It was a translation of the *Compost et Kalendrier des Bergers* printed in Paris in 1493, which was itself an adaptation of the *Vrai Regime et Gouvernement des Bergers* by Jehan de Brie in 1379. The earliest known English almanac is an "Almanacke for XII yere . . . . emprynted at London, in the Fletestrete by Wynkyn de Worde. In the yere of the Incarnacyon of our lorde a. MCCCCXCVII." From that time a continuous chain of such productions may be traced both in England and on the continent.

Owing to the influence which the heavenly bodies had or were supposed to have upon the earth, it was very easy to believe that they also ruled the fortunes of men, which gave rise to the science of astrology, or the knowledge of the stars, and to a class of men who claimed to be skilled in the science and to be able by the positions and aspects of the stars to foretell the fate and acts of nations and individuals, and to predict events of inanimate nature, such as changes of the weather, earthquakes, tornadoes, and the like. Naturally astrology was considered a higher science than astronomy, and astrologers were held in greater favor than astronomers. Astrology is one of the most ancient forms of superstition and prevailed among the Egyptians, Chaldaeans, Chinese and Hindoos from very early times. The Jews learned it during their captivity and afterwards practised it. It spread into the West and to Rome about the beginning of the Christian Era and astrologers played an important part in all the European countries until about the middle of the sixteenth century. Astrology was a powerful weapon in the hands of the ancient priesthood and in more modern times many famous astronomers were believers in it. The position of the stars was taken by means of an instrument called an

"astrolabe," which in the palmy days of astrology was the badge of an astrologer. Cardinal d'Ailly, who died in 1420, is said to have calculated the horoscope of Jesus Christ and to have maintained that the Deluge might have been predicted by astrology. Astronomy and astrology went hand in hand and the almanacs were the vehicle for proclaiming to the world the astrological predictions. Indeed the evil resulting from predictions, which in most cases proved to be false, caused Henry III of France in 1579 to prohibit the insertion of any political prophecies in the almanacs. The real death blow to astrology was given by Copernicus when in 1543 he published "De Revolutionibus Orbium." Astrology, however, is still in vogue among the more ignorant classes, and one of the most popular of the prophetic almanacs is the "Almanach Liegeois," which was first published in 1636. It is very popular among those who cannot read, for by special symbols attached to certain dates the most unlettered persons can follow its instructions: for instance, a pill-box designates the planet most propitious for pills, and a lancet for letting blood.

As one of the earliest, if not the first products of the press, at Mainz by the famous prototypographer Gutenberg was an almanac, so the first book printed in the English colonies in America, on the press which had been sent over by the Rev. Jose Glover, and set up in Cambridge, in the Massachusetts Bay Colony by Stephen Day, but worked undoubtedly by his son Matthew Day, was the almanac for 1639 calculated by the celebrated shipmaster, Captain William Pierce. Unfortunately no copy is known to be in existence. The oldest extant almanac printed in the English colonies in America is that for the year 1646 calculated by Samuel Danforth of Harvard College, and printed by Matthew Day. As Pierce's Almanac and Danforth's Almanac were printed at the same office and by the same printer it is reasonable to suppose that they resembled each other in size and number of leaves, and that they corresponded very closely to the almanacs printed in England at the same time.

Of the almanac of 1646 one copy only is known to be in existence. It measures 5¾ by 3½ inches and contains only one signature or eight leaves. The first leaf bears the title on the recto with astronomical matter on the verso (or rather did, as the first and last leaves are missing). The twelve months of the year which began with March, follow on the second to seventh leaf inclusive, together with various tables of the sun, moon, tides, etc., computed for each month. The eighth leaf contains miscellaneous information on both verso and recto. Perkins' Almanac of 1642 is made up in a very similar manner.

From 1646 to the present time almanacs have been published in the English Colonies in America, and their successors, every year with an occasional exception. At first the almanac of some one person was sufficient, then, a competitor for public favor appeared, until at the present time nearly every city and large town has one or more writers of almanacs, a mere list of whom would make a large catalogue.

The world has seen innumerable almanacs written to illustrate almost every conceivable subject. As early as 1729 a writer in *Le Mercure de France* says: "There have appeared almanacs upon so many different subjects that it would seem to be impossible to find a subject which would be sufficiently interesting upon which to compile one" but since that date perhaps more almanacs have been published varying in contents than ever before. There have been almanacs of the Gods, the Muses, the Graces, Goblins, Kings, and even of the Devil, the latter, according to the title-page, printed in 1733-35 "A L'Enfer."

In all ages and in all countries persons of the highest culture and most scientific attainments have compiled almanacs. Besides those already mentioned there were Solomon Jarchus, 1150, and Anton Purbach, 1452-1460. If good fortune brings to you the *Almanach Calcule sur le Meridional de Lyon,*" printed in 1533, congratulate yourself you have found a pearl of great price, for it

was compiled by Rabelais, of famous memory. Other early almanac makers were Anthon Askham, 1550; Nostradamus, 1579; Gabriel Frende, 1589; John Woodhouse, 1634; and William Lilly, 1644. A few well known English authors were Nicholas Culpepper, 1652; Henry Coley, 1688; John Gadbury; Francis Moore, Vincent Wing; Richard Saunders; Poor Robin (said to be the *nom de plume* of Robert Herrick, the poet); and Cardanus Rider. Among the American compilers were Capt. William Pierce, Samuel Danforth, Revs. Urian Oakes, Israel Chauncy, Samuel Cheever, Nehemiah Hobart, and John Sherman. John Foster, Revs. Cotton and Nathaniel Mather, John Tulley, N. Whittemore, and S. Clough.

The first Pennsylvania almanac, "Kalendarium Pennsilvaniense" which is one of the earliest works of the first printer of Philadelphia and New York, carries the imprint: "Printed and Sold by William Bradford" at Philadelphia in the year, 1685. It contained twenty unpaged leaves. When in 1880 the copy in the Brinley library was offered for sale it brought $555. Bradford also printed "An Almanach for the Year of Christian Account, 1694. By Daniel Leeds, Philomat. Printed and Sold by William Bradford at the Bible in New-York, 1694." Bradford removed to New York from Philadelphia in March or April, 1693, and the almanac is one of his early publications. Daniel Leeds says in his Almanach for 1700: "Friendly Readers: I have now freely served you with an Almanach twice seven years." The first genuine New York almanac is "An Almanac for 1697. By John Clapp," which was also printed by William Bradford. John Clapp, the editor, kept a house of entertainment "about two mile without the City of New York at the place called the Bowry." Against the 24th of June in the calendar, he gives notice that in commemoration of the feast of St. John Baptist, a feast is held by the *Johns* of this City, at John Clapp's in the Bowry, "where any gentleman whose Christian name is John may find a hearty Wellcome to joyn in

consort with his namesakes." In the preface he says: "To the Kind Reader, having little else to do, and finding this whole Province beholding to a stranger for a New England Almanach every year he did resolve to set himself upon the work." It contains 25 leaves and the Brinley copy sold in 1886 brought $420.

Benjamin Franklin, commencing in 1733, wrote and published for twenty-five years Poor Richard's Almanac under the pseudonym of Richard Saunders: James Franklin, elder brother of Banjamin, compiled and printed "The Rhode Island Almanach for the Year 1728. By Poor Robin," the imprint of which reads, "Newport, J. Franklin, at his Printing-House on Tillinghast's Wharf, near the Union Flag Tavern, 1728." It is the first work printed in Rhode Island. The pithy remarks and quaint proverbs of Poor Robin undoubtedly gave a hint to Poor Richard. Benjamin West was the author of the first almanac printed at Providence, namely, "The New England Almanac for 1763, and was also the author of the popular Bickerstaff almanacs printed in Providence, Boston, and other New England towns. The names "Poor Robin," "Poor Richard," and "Isaac Bickerstaff" were copied from the English originals.

Nathaniel Ames began his series of almanacs in 1726; Nathaniel Low in 1762; IsaiahThomas in 1774; Nathan Daboll in 1773; Chas. R. Webster in 1785; Robert B. Thomas in 1793; and Dudley Leavitt in 1797, the last four still having an annual issue, after having been published continuously for more than one hundred years.

The "Almanach de France" for 1845 discourses as follows:—"Fifteen millions of French people learn only by the almanacs the destinies of Europe, the laws of their country, the progress of the sciences, the arts, and industry. Almanacs are the village library. It is therefore important to give them a practical usefulness which shall satisfy the daily needs of the common people. The first duty which the betterment of their manners and intelligence imposes upon us is to purge our publications of the scandalous anecdotes and lying predictions

which offend public modesty or tend to prolong a dangerous superstition. This is what the Almanach de France has tried to do since its foundation and has been the principal cause of its great success from year to year.

Our readers will give us this credit that our intention and aim is to enlighten and moralize the masses. We shall be happy and well repaid if we contribute in a small way to that result which all eloquence and all pens ought to propose in a free and civilized country, namely to form citizens who will cause their laws to be respected by respecting their own obligations."

In the introduction to his delightful essay on Almanacs, Sam. Briggs of Cleveland, an old and valued friend, now passed beyond, says:—"No book or publication has ever been the subject of more ridicule and contempt than the Almanac, yet no book has been more universally read, or more highly valued, or more serviceable to its day and generation. From the earliest times and in all countries they have been consulted and treasured with an almost religious veneration; in earlier times they constituted the only reading matter in many families and copies were preserved from year to year for the useful informations and maxims which they contained, as well as the practical astronomy they taught. When we are aware that the almanack in early days constituted the only method of reaching the people generally, we appreciate the full importance of these publications and gain a clearer knowledge of the tastes and inclinations of the people among whom they were a popular and reverenced class of literature."

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